

1/23/17

Office Hours

Tuesday 10^{am} - 11^{am}Wednesday 12³⁰ - 1³⁰**A2CC Midterm Review Sheet****Midterm Exam: Wednesday, January 25th 2:00 – 3:30 in the Cafeteria****Exam Format:****Part 1: 17 multiple choice questions (no partial credit)****Part 2: 9 free response questions (partial credit)**

This review sheet should not be your only study guide. Please be sure to go over your old exams, homework and notes to fully prepare for the midterm.

Exponential Equations

1. Solve each of the following:

(a) $8^x = 2^{x+6}$

(b) $4^{2x-3} = \frac{1}{16}$

(c) $x^{\frac{3}{2}} = 64$

(d) $125^{-2x} = 25^{x+1}$

(e) $a^{\frac{3}{5}} - 2 = 25$

(f) $3(2m+3)^{\frac{2}{3}} + 2 = 77$

Rational Expressions

2. Simplify: $\frac{6x^2 + 12x}{x^3 - 5x^2 - 14x}$

3. Simplify: $\frac{x^2 - 2x - 24}{x^2 - 16}$

4. Find the value(s) of x for which the fraction is undefined:

(a) $\frac{12}{x-2}$

(b) $\frac{23}{6x}$

(c) $\frac{x^2 - 25}{x^2 + 6x + 8}$

In 5 – 8, perform the indicated operations and express answers in simplest form.

5. $\frac{3}{x+4} + \frac{2}{x}$

$$6. \frac{5x^2 - 5x - 60}{4x^2 - x} \cdot \frac{x^2 - 3x - 10}{x - 4} \div \frac{x^2 - 2x - 15}{8x^2 - 2x}$$

$$7. \frac{2x^2 - 16}{x^2 - 4} - \frac{x + 4}{x + 2}$$

$$8. \frac{x - 1}{x^2 + 3x + 2} + \frac{x}{x + 1}$$

$$9. \text{ Solve for } x: \frac{1}{6x} + \frac{8}{x} = \frac{x}{6}$$

$$10. \text{ Solve for } x: \frac{4n + 3}{n - 6} + \frac{n - 4}{6 - n} = \frac{44}{2n - 12}$$

$$11. \text{ Simplify each: (a) } \frac{1 + \frac{2}{a}}{\frac{2}{a} - \frac{a}{2}} \quad (b) \frac{x - \frac{9}{x}}{1 + \frac{3}{x}} \quad (c) \frac{1 - \frac{1}{16x^2}}{1 - \frac{1}{4x}} \quad (d) \frac{\frac{c}{2} - \frac{2}{c}}{1 + \frac{c}{2}}$$

Radicals

$$12. \text{ Simplify: } \frac{\sqrt{900}}{\sqrt{20}}$$

$$13. 2\sqrt{48} + 2\sqrt{12}$$

$$14. \sqrt{49a^2b^4} - \sqrt{16a^2b^4} + \sqrt{8a^2c}$$

$$15. \text{ Simplify: } \frac{3}{6 - 5\sqrt{2}}$$

$$16. \text{ Solve: } \sqrt{3x + 6} - 2 = 7$$

$$17. \text{ Solve: } 2\sqrt{2x - 6} + 8 = 4$$

Complex Numbers

$$18. \text{ Simplify: } \sqrt{-45x^4y^7}$$

$$19. 5\sqrt{-18} + \sqrt{-50} - \sqrt{-75}$$

$$20. \text{ Find the value of } i^{53}$$

$$21. (2 - 5i)(6 + 7i)$$

Factoring

22. Factor each of the following completely.

(a) $3x^2 + 5x - 2$

(b) $16x^4 - y^8$

(c) $2x^2 - 10x - 28$

(d) $x^3 + 3x^2 - 4x - 12$

(e) $8x^3 + 125$

Quadratics

23. Find all roots of the equation: $2x^2 - 3x = 2$

24. Solve by completing the square: $3x^2 = 6x - 15$

25. Describe the roots of the following quadratic equations:

(a) $2x^2 - 3x + 4 = 0$

(b) $\frac{1}{3}x^2 - x = 6$

(c) $x^2 - 6x = -9$

Inequalities

Solve each inequality and express the solution set in set builder notation.

26. $x^2 - x > 6$

27. $\frac{1}{x} < 1$

Solve each inequality and express the solution set in interval notation.

27. $x^2 - 7x \leq x$

28. $\frac{9}{x-4} \geq -6$

Solving Higher Degree Polynomials

Solve each of the following.

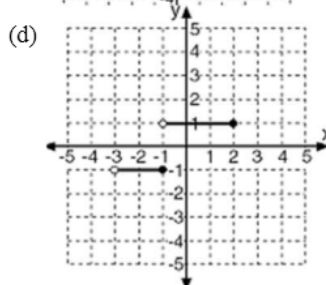
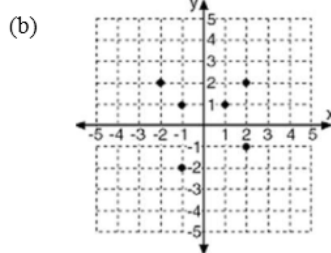
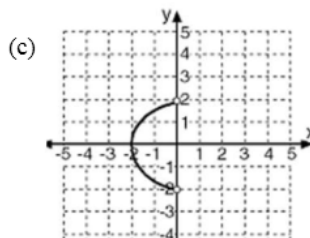
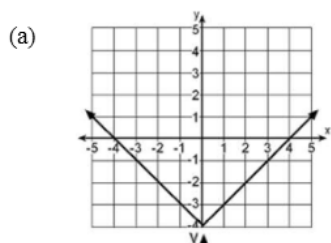
29. $x^3 + 3x^2 - 9x = 27$

30. $x^4 - 8x^2 + 16 = 0$

31. $(x^2 + 5x - 7)(x + 3) = 0$

Functions

32. Give the domain and range for each relation. Then tell whether the relation is a function.



33. Given $f(x) = 4 - x^2$, evaluate $f(-2)$.

In 34 – 39, determine whether or not the following relations are functions. *If they are functions:*

(a) determine whether or not they are one – to – one

34. $3x = -10 + 4y$

35. $x = y^2 - 2y - 24$

36. $x = 5$

37. $y = 10$

38. $y = |2x - 3|$

39. $y = x^2 - x - 6$

40. Determine the domain of each of the following functions.

(a) $f(x) = \frac{x+2}{x^2-x-20}$

(b) $g(x) = \sqrt{2x-5}$

(c) $h(x) = \frac{1}{\sqrt{3x-15}}$

41. Given $f(x) = 2\sqrt{x+3}$ and $g(x) = -3x+1$, find each value:

- (a) $f(g(1))$
- (b) $g(f(1))$
- (c) $g(f(6))$

42. Given $f(x) = 4x+3$ and $g(x) = \frac{x}{x+3}$, find:

- (a) $f(g(x))$
- (b) $g(f(x))$

43. Given $h(x) = -x^2 - 2$ and domain $-3 \leq x \leq 3$, find the largest element in the range.

44. Given $f(x) = \frac{7-8x}{3}$. Is $f(x)$ one to one? Explain your answer.

45. Determine the domain and range of $f(x) = \{(1,2), (3,4), (5,6), (7,8)\}$. Find the inverse of $f(x)$. Is $f(x)$ one to one?

Laws of Exponents

46. Simplify each expression and write the answer using only positive exponents:

(a) $\frac{2x^{-2}y^{-2}}{4y^{-5}}$ (b) $\frac{3x^{-4}y^5}{(2x^3y^{-7})^{-2}}$

47. Rewrite the expression $x^{-\frac{2}{5}}$ as an equivalent expression in radical form.

Polynomials

48. Write $\frac{2x^3 - x^2 - 6x - 1}{x+1}$ in the form $q(x) + \frac{r}{x+1}$, where $q(x)$ is a polynomial and r is a constant.

49. Is $(x+2)$ a factor of $3x^4 + 7x^3 + 3x^2 - x - 4$. Explain your answer.

50. What is the remainder when $6x^5 + 21x^4 - 14x^3 - 8x^2 + x - 6$ is divided by $(x+4)$?

51. What is the complete factorization of $4x^4 - x^3 - 4x^2 + 1x$?

52. What is the complete solution set of $P(x) = x^6 + 2x^4 - 16x^2 - 32$?

53. Sketch $f(x) = (x+3)^2(x-5)$ (be sure to label all x and y intercepts)

Circles

54. Determine the center and radius of the circle whose equation is $x^2 + y^2 + 8x + 25 = 6y + 15$

1) $8^x = 2^{x+6}$
 If Bases are = Exponents are =
 $(2)^3 = 2^{x+6}$
 $2^{3x} = 2^{x+6}$

$$\begin{array}{r} 3x = -x + 6 \\ -x = -x + 6 \\ \hline 2x = 6 \\ x = 3 \end{array}$$

b) $4^{2x-3} = \frac{1}{16}$

$$4^{2x-3} = \left(\frac{1}{4}\right)^1$$

$$4^{2x-3} = (4)^{-1}$$

$$\begin{array}{r} 2x-3 = -1 \\ +3 \quad +3 \\ \hline 2x = 2 \\ x = 1 \end{array} \quad x = \frac{1}{2}$$

c) $x^{\frac{3}{2}} = 64$

$$x = 16$$

d)

$125^{(2x)} = 25^{x+1}$ ** careful to distribute*
 $25 = 5^2$
 $125 = 5^3$
 $(5)^{6x} = (5)^{2x+2}$

$$5^{-6x} = 5^{2x+2}$$

$$\begin{array}{r} -6x = 2x+2 \\ -2x \quad -2x \\ \hline -8x = 2 \\ -8 \quad -8 \\ \hline x = -\frac{1}{4} \end{array}$$

* To Solve Use Reverse PEMDAS (+2 first)

e) $a^{\frac{3}{2}} - 2 = 25$

$$\begin{array}{r} a^{\frac{3}{2}} - 2 = 25 \\ +2 \quad +2 \\ \hline a^{\frac{3}{2}} = 27 \end{array}$$

$$a = 243$$

f) $3(2m+3)^{\frac{2}{3}} + 2 = 77$

$$\begin{array}{r} 3(2m+3)^{\frac{2}{3}} + 2 = 77 \\ -2 \quad -2 \\ \hline 3(2m+3)^{\frac{2}{3}} = 75 \\ \div 3 \quad \div 3 \\ (2m+3)^{\frac{2}{3}} = 25 \end{array}$$

Even add need ±

"OLD McDonald" Plus + minus is the rule Even given odd * original fraction

$$2m+3 = \pm 125$$

$$\begin{array}{r} 2m+3 = 125 \\ -3 \quad -3 \\ \hline 2m = 122 \\ \div 2 \quad \div 2 \\ m = 61 \end{array}$$

$$\text{or } \begin{array}{r} 2m+3 = -125 \\ -3 \quad -3 \\ \hline 2m = -128 \\ \div 2 \quad \div 2 \\ m = -64 \end{array}$$

2) $\textcircled{*}$ Simplify = FACTOR (FACTOR FIRST) Don't forget restrictions

$$\frac{6x^2 + 12x}{x^3 - 5x^2 - 14x} = \frac{6x(x+2)}{x(x^2 - 5x - 14)} = \frac{\cancel{6x}(\cancel{x+2})}{\cancel{x}(\cancel{x-7})(\cancel{x+2})}$$

restrictions:
 $x \neq 7, -2, 0$

$$= \boxed{\frac{6}{x-7}}$$

3)

$$\frac{x^2 - 2x - 24}{x^2 - 16} = \frac{(x-6)\cancel{(x+4)}}{(\cancel{x+4})(x-4)} = \boxed{\frac{x-6}{x-4}}$$

rest:
 $x \neq 4, -4$

4) a) $\frac{12}{x-2}$ $\begin{array}{r} x-2=0 \\ +2 \quad +2 \\ \hline x=2 \end{array}$ $\boxed{x=2}$

b) $\frac{23}{6x}$ $\frac{6x}{6} = \frac{0}{6}$ $\boxed{x=0}$

c) $\frac{x^2 - 25}{x^2 + 6x + 8}$ $\begin{array}{l} x^2 + 6x + 8 = 0 \\ (x+4)(x+2) = 0 \\ \boxed{x=-4 \quad x=-2} \end{array}$

5) $\frac{3}{x} + \frac{2(x+4)}{x(x+4)}$

LCD:
 $\frac{3x}{x(x+4)} + \frac{2x+8}{x(x+4)} = \frac{5x+8}{x(x+4)}$
 $x \neq 0, -4$

6) $\frac{5(x^2-x-12)}{4x^2-x} \cdot \frac{(x-5)(x+2)}{x-4} \cdot \frac{2x(4x-1)}{x^2-2x-15}$

$\frac{5(x^2-x-12)}{4x^2-x} \cdot \frac{(x-5)(x+2)}{x-4} \cdot \frac{2x(4x-1)}{(x-5)(x+3)}$

$x \neq 0, \frac{1}{4}, 4, 5, -3$

$$5(x+2)(2) = 10x+20$$

7) $\frac{2(x^2-8)}{x^2-4} - \frac{(x+4)(x-2)}{x+2(x-2)}$

LCD:
 $\frac{(x+2)(x-2)}{x \neq -2, 2}$

$$\frac{2x^2-16}{(x+2)(x-2)} - \frac{x^2+2x-8}{(x+2)(x-2)} = \frac{(x-4)(x+2)}{(x+2)(x-2)} = \frac{x-4}{x-2}$$

8) $\frac{x-1}{x^2+3x+2} + \frac{x}{x+1(x+2)}$

LCD:
 $\frac{(x+2)(x+1)}{x \neq -1, -2}$

$$\frac{x-1}{(x+2)(x+1)} + \frac{x(x+2)}{(x+1)(x+2)} = \frac{x-1+x^2+2x}{(x+2)(x+1)}$$

$$= \frac{x^2+3x-1}{(x+2)(x+1)}$$

9) $\frac{1}{6x} + \frac{8}{x} = \frac{x}{6}$

LCD:
 $6x$
 $x \neq 0$

$$1 + 48 = x^2$$

$$49 = x^2$$

$$\pm 7 = x$$

10) $\frac{4n+3}{n-6} + \frac{n-4}{6-n} = \frac{22}{2n-12}$

$\frac{1}{4} = -\frac{1}{4}$

$\text{LCD} = (n-6)$
 $n \neq 6$

Same denominator
So solve the "TOPS"

$$\frac{4n+3}{n-6} + \frac{-1(n-4)}{n-6} = \frac{22}{n-6}$$

$$4n+3 - n+4 = 22$$

$$3n+7 = 22$$

$$\begin{array}{r} 3n+7 = 22 \\ -7 \quad -7 \\ \hline 3n = 15 \\ \frac{3n}{3} = \frac{15}{3} \end{array}$$

$n=5$

11) a) $\frac{1}{1} + \frac{2}{2} = \frac{2a+4}{4-a^2} = \frac{2(a+2)}{(2-a)(2+a)}$

$\text{LCD: } 2a$
 $a \neq 0$
 $a \neq 2, -2$

$\frac{2}{2-a}$

b) $\frac{x-9}{x} = \frac{x^2-9}{x+3} = \frac{(x+3)(x-3)}{x+3} = x-3$

$\text{LCD: } x$
 $x \neq 0$
 $x \neq -3$

c) $\frac{1}{1} - \frac{1}{4x} = \frac{16x^2-1}{16x^2-4x} = \frac{(4x+1)(4x-1)}{4x(4x-1)}$

$\text{LCD: } 16x^2$
 $x \neq 0$
 $x \neq \frac{1}{4}$

$\frac{4x+1}{4x}$

d) $\frac{c}{2} - \frac{2}{c} = \frac{c^2-4}{2c+c^2} = \frac{(c+2)(c-2)}{c(c+2)}$

$\text{LCD: } 2c$
 $c \neq 0$
 $c \neq -2$

$\frac{c-2}{c}$

$$12) \quad \frac{\sqrt{900}}{\sqrt{20}} = \sqrt{\frac{900}{20}} = \sqrt{45}$$

$$\begin{array}{c} \swarrow \quad \searrow \\ \sqrt{9} \quad \sqrt{5} \\ \boxed{3\sqrt{5}} \end{array}$$

$$13) \quad 2\sqrt{48} + 2\sqrt{12}$$

$$\begin{array}{cc} \swarrow & \swarrow \\ 2\sqrt{16}\sqrt{3} & 2\sqrt{4}\sqrt{3} \\ 2 \cdot 4\sqrt{3} & 2 \cdot 2\sqrt{3} \\ 8\sqrt{3} & + 4\sqrt{3} \\ \boxed{12\sqrt{3}} \end{array}$$

$$14) \quad \sqrt{49a^2b^4} - \sqrt{16a^2b^4} + \sqrt{8a^2c}$$

$$\begin{array}{ccc} \downarrow & \downarrow & \swarrow \quad \searrow \\ 7ab^2 & - 4ab^2 & + 2a\sqrt{2c} \\ \boxed{3ab^2 + 2a\sqrt{2c}} \end{array}$$

15) $\frac{3}{6-5\sqrt{2}} \cdot \frac{6+5\sqrt{2}}{6+5\sqrt{2}} = \frac{18+15\sqrt{2}}{36-25\sqrt{4}} = \frac{18+15\sqrt{2}}{36-25(2)}$

$$= \frac{18+15\sqrt{2}}{36-50}$$

$$= \frac{18+15\sqrt{2}}{-14}$$

16) $\sqrt{3x+6} - 2 = 7$

$$\frac{\sqrt{3x+6} + 2}{+2 \quad +2} = \frac{9}{9}$$

$$(\sqrt{3x+6})^2 = (9)^2$$

$$\begin{array}{r} 3x+6 = 81 \\ -6 \quad -6 \\ \hline 3x = 75 \\ \frac{3x}{3} = \frac{75}{3} \end{array}$$

$$x = 25$$

17) $2\sqrt{2x-6} + 8 = 4$

$$\frac{2\sqrt{2x-6} - 8}{-8 \quad -8} = \frac{-4}{-4}$$

$$\frac{2\sqrt{2x-6}}{2} = \frac{-4}{2}$$

$$(\sqrt{2x-6})^2 = (-2)^2$$

$$\begin{array}{r} 2x-6 = 4 \\ +6 \quad +6 \\ \hline 2x = 10 \\ \frac{2x}{2} = \frac{10}{2} \end{array}$$

$$x = 5$$

Check:

$$2\sqrt{2(5)-6} + 8 = 4$$

$$2\sqrt{10-6} + 8 = 4$$

$$2\sqrt{4} + 8 = 4$$

$$2 \cdot 2 + 8 = 4$$

$$4 + 8 = 4$$

$$12 = 4$$

No!

No Solutions

18) $\sqrt{945x^4y^7}$

$$\sqrt{9x^4y^6} \cdot \sqrt{5y}$$

$$3x^2y^3 \sqrt{5y}$$

19)

$$5\sqrt{18} + \sqrt{50} - \sqrt{75}$$

$$\begin{array}{ccc} \textcircled{5i}\sqrt{18} & + & \textcircled{i}\sqrt{50} - \textcircled{i}\sqrt{75} \\ \downarrow \sqrt{9}\sqrt{2} & & \downarrow \sqrt{25}\sqrt{2} \quad \downarrow \sqrt{25}\sqrt{3} \\ 5i \cdot 3\sqrt{2} & & i \cdot 5\sqrt{2} \quad i \cdot 5\sqrt{3} \end{array}$$

$$\boxed{15i\sqrt{2} + 5i\sqrt{2} - 5i\sqrt{3}}$$

$$\boxed{20i\sqrt{2} - 5i\sqrt{3}}$$

20)

$$i^5 = \boxed{i}$$

$$i^3 = -i$$

$$i^2 = -1$$

$$i^0 = 1$$

$$i^1 = i$$

$$i^4 = 1$$

$$i^5 = i$$

$$i^6 = -1$$

$$i^7 = -i$$

$$i^8 = 1$$

$$i^9 = i$$

$$i^{10} = -1$$

$$i^{11} = -i$$

$$i^{12} = 1$$

$$i^{13} = i$$

$$i^{14} = -1$$

$$i^{15} = -i$$

$$i^{16} = 1$$

$$i^{17} = i$$

$$i^{18} = -1$$

$$i^{19} = -i$$

$$i^{20} = 1$$

$$i^{21} = i$$

$$i^{22} = -1$$

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$$i^{92} = 1$$

$$i^{93} = i$$

$$i^{94} = -1$$

$$i^{95} = -i$$

$$i^{96} = 1$$

$$i^{97} = i$$

$$i^{98} = -1$$

$$i^{99} = -i$$

$$i^{100} = 1$$

21)

$$(2-5i)(6+7i)$$

$$12 + 14i - 30i - 35i^2$$

$$12 - 16i - 35(-1)$$

$$12 - 16i + 35$$

$$\boxed{47 - 16i}$$

22) a) $3x^2 + 5x - 2$ $AC = -6$

$3x^2 + 6x \quad | \quad -1x - 2$ ← Grouping

$3x(x+2) \quad | \quad -1(x+2)$

$(3x-1)(x+2)$

b) $16x^4 - y^8$ ← DOTS

$(4x^2 - y^4)(4x^2 + y^4)$

$(2x - y^2)(2x + y^2)(4x^2 + y^4)$

c) $2x^2 - 10x - 28$

$2(x^2 - 5x - 14)$

$2(x-7)(x+2)$

d) $x^3 + 3x^2 - 4x - 12$

$x^2(x+3) - 4(x+3)$

$(x+3)(x^2-4)$

$(x+3)(x+2)(x-2)$

e) $8x^3 + 125$ SOAP

$(2x+5)((2x)^3 - (2x)(5) + (5)^2)$

$(2x+5)(4x^2 - 10x + 25)$

23) $2x^2 - 3x = 2$
 $2x^2 - 3x - 2 = 0$
 $a=2$
 $b=-3$
 $c=-2$

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(-2)}}{2(2)}$$

$$x = \frac{3 \pm \sqrt{9+16}}{4} = \frac{3 \pm \sqrt{25}}{4} = \frac{3 \pm 5}{4}$$

$$x = \frac{-1}{2}, 2$$

AND $\frac{3+5}{4} = \frac{8}{4} = 2$
 $\frac{3-5}{4} = \frac{-2}{4} = -\frac{1}{2}$

24) $\frac{3x^2}{3} = \frac{6x}{3} - \frac{15}{3}$ # in front of x^2 must be 1
 $x^2 = 2x - 5$
 $x^2 - 2x = -5$
 $x^2 - 2x + \boxed{1} = -5 + \boxed{1}$
Half Square Share $(x-1)^2 = -4$
 $x-1 = \pm \sqrt{-4}$
 $x-1 = \pm 2i$
 $x = 1 \pm 2i$

25) Describe = discriminant $b^2 - 4ac$
a) $2x^2 - 3x + 4 = 0$
 $(-3)^2 - 4(2)(4)$
 $9 - 32$
(negative) $-23 \leftarrow$ Imaginary Roots

b) $\frac{1}{3}x^2 - x = 6$
 $\frac{1}{3}x^2 - x - 6 = 0$
 $(-1)^2 - 4(\frac{1}{3})(-6)$
 $1 + 8$
Positive Perfect Square $9 \leftarrow$ Real, Rational, Unequal

c) $x^2 - 6x = -9$
 $x^2 - 6x + 9 = 0$
 $(-6)^2 - 4(1)(9)$
 $36 - 36$
 $0 \leftarrow$ Real, Rational, Equal

26)
$$\begin{array}{r} x^2 - x > 6 \\ -6 \quad -6 \\ \hline x^2 - x - 6 > 0 \end{array}$$

G O L I
open circles

$(x-3)(x+2)$
 $x=3 \quad x=-2$

Set Builder:
 $\{x \mid x < -2 \text{ or } x > 3\}$

27) $\frac{1}{x} < 1$

$\frac{1}{x} - 1 < 0$

$\frac{1}{x} - \frac{x}{x} < 0$

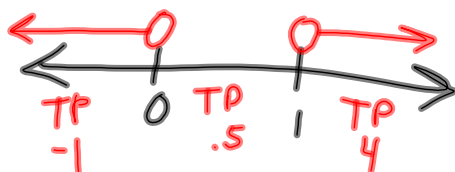
$\frac{1-x}{x} < 0$

$\frac{x}{x} \cdot \frac{1}{1} = \frac{x}{x}$

Set Builder

$$\{x \mid x < 0 \vee x > 1\}$$

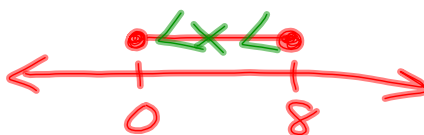
$1-x=0 \quad x=0$
 $1=x$ open circles



27)
$$\begin{array}{r} x^2 - 7x \leq x \\ -x \quad -x \\ \hline x^2 - 8x \leq 0 \end{array}$$

G O L I

$x(x-8)$
 $x=0 \quad x=8$



$$[0, 8]$$

28)

$$\frac{9}{x-4} \geq -6$$

+6 +6

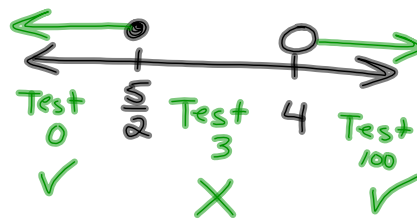
$$\frac{9}{x-4} + \frac{6(x-4)}{1(x-4)} \geq 0$$

$$\frac{9}{x-4} + \frac{6x-24}{x-4} \geq 0$$

$$\frac{-15+6x}{x-4} \geq 0$$

$$\begin{aligned} -15+6x &= 0 \\ 6x &= 15 \\ \frac{6x}{6} &= \frac{15}{6} \\ x &= \frac{5}{2} \\ &\text{closed} \end{aligned}$$

$$\begin{aligned} x-4 &= 0 \\ x &= 4 \\ &\text{open} \end{aligned}$$



Interval:

$$\left(-\infty, \frac{5}{2}\right] \cup (4, \infty)$$

$$29) \quad x^3 + 3x^2 - 9x = 27$$

$$x^3 + 3x^2 - 9x - 27 = 0$$

$$x^2(x+3) - 9(x+3) = 0$$

$$(x^2-9)(x+3) = 0$$

$$(x+3)(x-3)(x+3) = 0$$

$$x = -3 \quad x = 3 \quad x = -3$$

$$x = -3, 3$$

$$30) \quad x^4 - 8x^2 + 16 = 0$$

$$(x^2 - 4)(x^2 - 4) = 0$$

$$(x+2)(x-2)(x+2)(x-2) = 0$$

$$\boxed{x = 2, -2}$$

$$31) \quad (x^2 + 5x - 7)(x+3) = 0$$

Already Factored!

$$a=1 \quad b=5 \quad c=-7$$

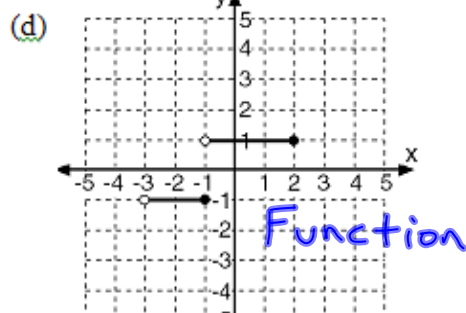
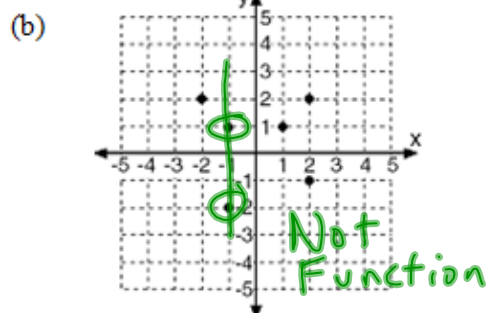
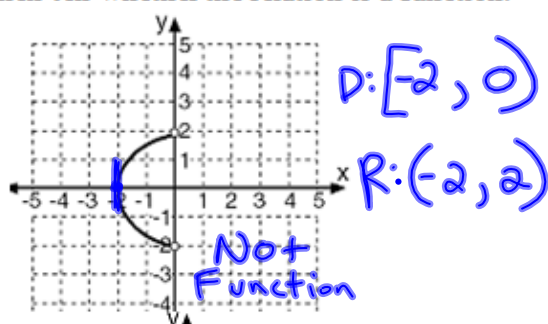
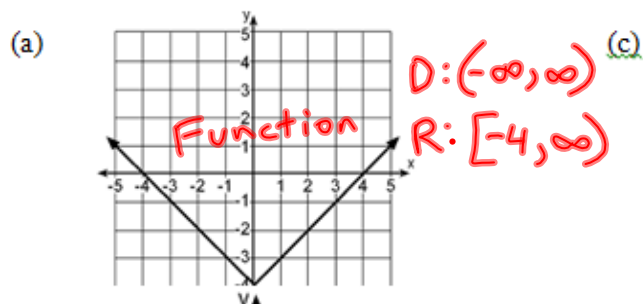
$$x = -3$$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(1)(-7)}}{2(1)}$$

$$x = \frac{-5 \pm \sqrt{53}}{2}$$

$$\boxed{x = -3, \frac{-5 \pm \sqrt{53}}{2}}$$

32. Give the domain and range for each relation. Then tell whether the relation is a function.



$$D: \{-2, -1, 1, 2\}$$

$$R: \{-2, -1, 1, 2\}$$

$$D: (-3, 2]$$

$$R: \{-1, 1\}$$

$$33) f(x) = 4 - x^2$$

$$f(-2) = 4 - (-2)^2$$

$$x = -2 = 4 - 4$$

$$f(-2) = \boxed{0}$$

$$f(x) = -2$$

$$y = -2$$

$$34) 3x = -10 + 4y$$

$$\frac{3x+10}{4} = \frac{4y}{4}$$

$$\frac{3}{4}x + \frac{10}{4} = y$$

$$y = \frac{3}{4}x + \frac{10}{4} \text{ (line)}$$

It is a function
and is 1 to 1

Look at the graph

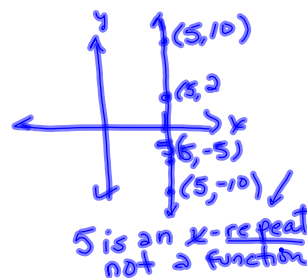
$$35) x = y^2 - 2y - 24$$

Not a function when
we have y^2 .



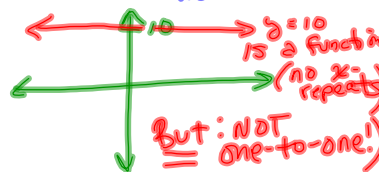
$$36) x = 5 \text{ (vertical line)}$$

Not a function



$$37) y = 10 \text{ (horizontal line)}$$

It is a function
but not 1 to 1



$$38) y = |2x - 3| \text{ (absolute value)}$$

It is a function
but not 1 to 1



$$39) y = x^2 - x - 6 \text{ (Parabola)}$$

It is a function
but not 1 to 1



40) a) $\frac{x+2}{x^2-x-20} \neq 0$

$$(x-5)(x+4) \neq 0$$

$$x \neq 5 \quad x \neq -4$$

$$\boxed{x \neq -4, 5}$$

b) $g(x) = \sqrt{2x-5}$

$$\begin{array}{r} 2x-5 \geq 0 \\ +5 \quad +5 \\ \hline 2x \geq 5 \\ \frac{2x}{2} \geq \frac{5}{2} \\ \boxed{x \geq \frac{5}{2}} \end{array}$$

c) $\frac{1}{\sqrt{3x-15}}$

$$\begin{array}{r} 3x-15 > 0 \\ +15 \quad +15 \\ \hline 3x > 15 \\ \frac{3x}{3} > \frac{15}{3} \\ \boxed{x > 5} \end{array}$$

41) $f(x) = 2\sqrt{x+3}$ $g(x) = -3x+1$

a) $f(g(1)) = \begin{cases} g(1) = -3(1)+1 = -2 \\ f(-2) = 2\sqrt{-2+3} = 2\sqrt{1} = \boxed{2} \end{cases}$

b) $g(f(1))$

$$f(1) = 2\sqrt{1+3} = 2\sqrt{4} = 4$$

$$g(4) = -3(4)+1 = \boxed{-11}$$

c) $g(f(6))$

$$f(6) = 2\sqrt{6+3} = 2\sqrt{9} = 2 \cdot 3 = 6$$

$$g(6) = -3(6)+1 = -18+1 = \boxed{-17}$$

42) $f(x) = 4x + 3$ $g(x) = \frac{x}{x+3}$

a) $f(g(x)) = f\left(\frac{x}{x+3}\right) = 4\left(\frac{x}{x+3}\right) + 3$

$\rightarrow = \frac{4x}{x+3} + \frac{3(x+3)}{1(x+3)} = \frac{4x}{x+3} + \frac{3x+9}{x+3} = \frac{7x+9}{x+3}$

b) $g(f(x)) = g(4x+3) = \frac{4x+3}{4x+3+3} = \frac{4x+3}{4x+6}$

43) $h(x) = -x^2 - 2$

Plug in to
Y = on calc
then look at
table of values

x	y
-3	-11
-2	-6
-1	-3
0	-2
1	-3
2	-6
3	-11

$y = -2$

largest

44) $f(x) = \frac{7-8x}{3} = \frac{7}{3} - \frac{8}{3}x = -\frac{8}{3}x + \frac{7}{3}$

It is 1 to 1
(Passes Horizontal
and Vertical Linetests)

Line with a slope
of $-\frac{8}{3}$ and y-int of $\frac{7}{3}$
(Look at the graph)

45) $f(x) = \{(1,2) (3,4) (5,6) (7,8)\}$

Domain: $\{1, 3, 5, 7\}$ $f^{-1}(x) = \{(2,1) (4,3) (6,5) (8,7)\}$

Range: $\{2, 4, 6, 8\}$ $f(x)$ is 1 to 1

46) a) $\frac{2x^{-2}y^{-2}}{4y^{-5}} = \frac{\cancel{2}x^{-2}y^3}{\cancel{4}y^{-5}} = \frac{y^3}{2x^2} \quad \begin{matrix} x \neq 0 \\ y \neq 0 \end{matrix}$

b) $\frac{3x^{-4}y^5}{(2x^3y^{-1})^{-2}} = \frac{3x^{-4}y^5}{2^{-2}x^{-6}y^{-14}} = \frac{3x^2}{2^{-2}y^9} = \frac{2^2 \cdot 3x^2}{y^9} = \frac{12x^2}{y^9} \quad \begin{matrix} x \neq 0 \\ y \neq 0 \end{matrix}$

47) $\frac{x^{-\frac{2}{5}}}{1} = \frac{1}{x^{\frac{2}{5}}} = \frac{1}{\sqrt[5]{x^2}}$

\otimes Power
Root

48)
$$\begin{array}{r} 2x^2 - 3x - 3 + \frac{2}{x+1} \\ x+1 \overline{) 2x^3 - x^2 - 6x - 1} \\ \underline{-(2x^3 + 2x^2)} \\ -3x^2 - 6x \\ \underline{-(-3x^2 - 3x)} \\ -3x - 1 \\ \underline{-(-3x - 3)} \\ 2 \end{array}$$

$q(x) + \frac{r}{x+1}$
 $= 2x^2 - 3x - 3 + \frac{2}{x+1}$

Alternate way:

$x+1=0$
 $x=-1$

-1	2	-1	-6	-1
		-2	3	3
	2	-3	-3	2

$2x^2 - 3x - 3 + \frac{2}{x+1}$

$$49) \quad x+2=0$$

$$x=-2$$

Plug in

$$3(-2)^4 + 7(-2)^3 + 3(-2)^2 - (-2) - 4$$

$$3(16) + 7(-8) + 3(4) + 2 - 4$$

$$48 - 56 + 12 + 2 - 4 = 2$$

It $\neq 0$, Not a factor

$$50) \quad x+4=0$$

$$x=-4$$

$$6(-4)^5 + 21(-4)^4 - 14(-4)^3 - 8(-4)^2 + (-4) - 6 = \boxed{-10} \quad \text{Remainder}$$

$$51) \quad 4x^4 - x^3 - 4x^2 + 1x$$

$$\times (4x^3 - x^2 - 4x + 1)$$

$$\times (x^2(4x-1) - 1(4x-1))$$

$$\times (4x-1)(x^2-1)$$

$$\times (4x-1)(x+1)(x-1)$$

$$52) \quad P(x) = x^6 + 2x^4 - 16x^2 - 32$$

$$x^4(x^2+2) - 16(x^2+2)$$

$$(x^2+2)(x^4-16)$$

$$(x^2+2)(x^2+4)(x^2-4)$$

$$(x^2+2)(x^2+4)(x+2)(x-2) = 0$$

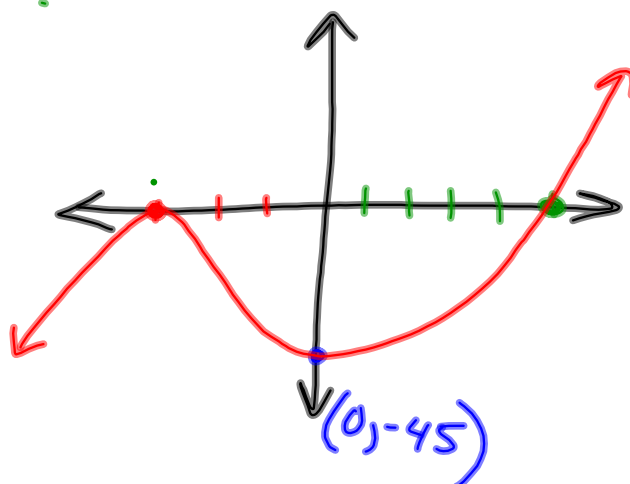
$x^2+2=0$ $x^2=-2$ $x=\pm\sqrt{-2}$ $x=\pm i\sqrt{2}$	$x^2+4=0$ $x^2=-4$ $x=\pm\sqrt{-4}$ $x=\pm 2i$	$x+2=0$ $x=-2$	$x-2=0$ $x=2$
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$$x = \pm i\sqrt{2}, \pm 2i, \pm 2$$

$$53) f(x) = (x+3)^2(x-5)$$

$x = -3$
bounce

$x = 5$
cross



y-intercept:

$$x=0 \quad y = (0+3)^2(0-5)$$

$$y = (3^2)(-5)$$

$$y = (9)(-5)$$

$$y = -45$$

$$54) \quad x^2 + y^2 + 8x + 25 = 6y + 15$$

$$\begin{array}{r} -6y \quad -25 \quad -6y \quad -25 \\ \hline x^2 + 8x + y^2 - 6y = -10 \end{array}$$

$$x^2 + 8x + \boxed{16} + y^2 - 6y + \boxed{9} = -10 + \boxed{16} + \boxed{9}$$

Half
Square
Share

$$\frac{8}{2} = 4 \quad 4^2 = 16$$

$$-\frac{6}{2} = -3 \quad (-3)^2 = 9$$

$$(x+4)^2 + (y-3)^2 = 15$$

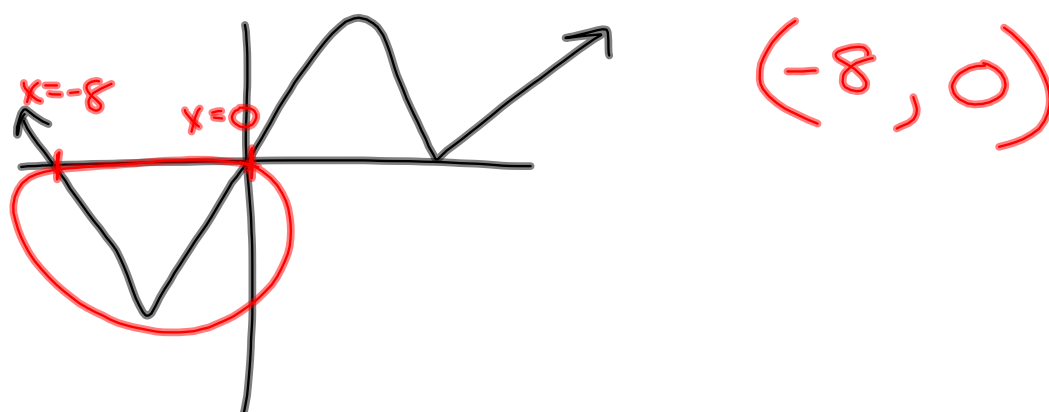
center: $(-4, 3)$

radius: $\sqrt{15}$

Test 3

14)b)

$y < 0$
 $f(x) < 0$
(below x-axis)



Q2 Test 2

9b) $x-2$ a factor $2x^2 + 5x - 14$

$$x-2=0$$
$$x=2$$

$$2(2)^2 + 5(2) - 14$$
$$8 + 10 - 14 = 4$$

Review Q1 Exam 2

$$15) (rs)^3 (2s)^{-2} (4r)^4$$

$$(r^3 s^3) \left(\frac{1}{2s}\right)^2 (256r^4)$$

$$\left(\frac{r^3 s^3}{1}\right) \left(\frac{1}{4s^2}\right) \left(\frac{256r^4}{1}\right) = \frac{64 \cancel{256} r^7 s^3}{\cancel{4} s^2 \cancel{8}} = \boxed{64r^7s}$$

Test 1 Q2

$$\begin{array}{l} 2) \quad \cancel{(3x)} \frac{1}{\cancel{3}} + \frac{1}{\cancel{3x}} \cancel{(3x)} \\ \text{LCD } 3x \quad \cancel{(3x)} \frac{1}{\cancel{x}} + \frac{1}{\cancel{3}} \cancel{(3x)} \end{array} = \boxed{\frac{x+1}{3+x}}$$

